

CONCEPTUAL AND STATISTICAL MODELING FOR IDENTIFYING LINKAGES AMONG SUPPLY CHAIN STRATEGY, FLEXIBILITY AND PERFORMANCE

AMIT CHANDAK¹ & ANSHUL GANGELE²

¹Research Scholar, Department of Mechanical Engineering, Suresh Gyan Vihar University, Jaipur, Rajasthan, India

²Professor, Department of Mechanical Engineering, Suresh Gyan Vihar University, Jaipur, Rajasthan, India

ABSTRACT

In the current competitive and globalized market situation, the supply chain performance (SCP) and supply chain management (SCM) practices such as supply chain strategy (SCS), supply chain flexibility (SCF) are playing a very important role in enhancing the overall performance of any organization. A hike is noted in the number of firms trying their utmost to achieve strategic competitiveness through befitting implementation of SCM practices, and thereby taking their performance to the next level. SCM, now turned out as one of the fastest growing and key area in management, as a result of which, it successfully grabbed the attention of top management in respective organizations. This study significantly examines the relationship of SCS; SCF with SCP in the Indian automobile industry, and this association was examined through statistical methods such as the correlation coefficient (Pearson) and structural equation modeling (SEM). The final result reveals that SCS and SCF have a momentous correlation with SCP. Specially SCS parameters such as innovative strategy (INS), customer-oriented strategy (COS), and agile supply chain strategy (ASCS) has a high correlation with SCP. The SEM result also shows that SCF parameters such as Innovative & new product flexibility (IF), process flexibility (PF), delivery flexibility (DF), information flexibility (INF) and existing product flexibility (EPF) appear to be of chief importance and show evidence of the importance of SCP. The result shows the significant importance of SCP of the automotive industry in India. The result findings also suggest that the automotive industry should firmly emphasis on SCM practices.

KEYWORDS: Supply Chain Strategy (SCS); Supply Chain Flexibility (SCF) & Supply Chain Performance (SCP)

Received: Apr 02, 2019; **Accepted:** Apr 22, 2019; **Published:** May 22, 2019; **Paper Id.:** IJMPERDJUN2019107

INTRODUCTION

The rapid progression and modernization in technology due to innovation offer tremendous opportunities for Indian automobile industries to achieve competitive perks by effectively managing their supply chain. Companies are now following customer-oriented approach with the assistance of respective suppliers in their business. They need to focus on enhancing SCM actions from untreated material purchase to finishing the product delivered to the end user. Researchers and academicians deliver an ever-increasing special treatment to SCM, which can be visualized as one of the fastest growing areas in management. Even though, a high chance of failure in ineffective implementation of best practices in SCM still exists (Donlon, 1996, Malik et.al. 2011). Nowadays, due to intense competition, SCM turned out as a crucial and important area of modern management companies. They design their SCM network as per the need and demand of customer, so that they can serve them efficiently and effectively (M. Poiger, 2010). Previous research shows that SCP is related to SCM practices (Christopher, 1998;

Bhasin, 2008). This paper bridges the gap by examining the impact of SCF and SCS on SCP in the Indian automobile industry by analyzing data, using the statistical method using SPSS-23 and SEM by using Smart-PLS. This study also identified the likelihood of taking appropriate SCS, which can amplify the overall performance. This paper bridges literature gap on the same studies. The main objective of this research is to empirically assess the importance of SCS and SCF with SCP. This paper is organized in the following manner. On the primary note, this study gives a concise clarification on practices of SCM and review of the topic; secondly, it gives the complete model and frames the hypotheses. Thirdly it discusses the line of attack adopted and test conducted. Fourthly, it presents the result of SEM using Smart-PLS. At the end of the paper, the overall findings and implications of the result are discussed.

LITERATURE REVIEW

The main targets in this examination were intended to look at the impact of SCM strategy and SCF on SCP, and to decide if these practices have any impact on SCP. With the above targets, there are 3 ideas that should have been investigated to get a comprehension of the destinations. The 3 ideas are as follows:

- SCS that encompasses innovative strategy, agile supply chain strategy, and customer-oriented strategy,
- SCF that contains the new-fangled product, process, delivery, existing product and information flexibility,
- SCP in terms of cost performance, logistic performance, and customer satisfaction performance.

Now days, in competitive business environment, SCM has been one of the important aspects for every organization. To compete in such ready for action situation, firms must take on a suitable SCS. This strategy varied from product to product, every product is unique for the company and required specific SCS. Strategy for each product or service industries largely depends on make available and requires uncertainty, manufactured goods lifecycle and built-up strategies. Due to these uncertainties, different supply chain strategies emerged (H.L. Lee, 2002). Flexibility is an essential part of any organizational activity to respond to the ever-changing and challenging business environment. Russell and Taylor (2009) defined supply chain flexibility as a capacity to adjust with changes in item for consumption mix, manufacture volume or design. It is the capability to create a broad range of goods, to bring in new manufactured goods and alter on hand product quickly, and take action to client requirements.

THE CONCEPTUAL FRAMEWORK

The projected model (Figure 1: The Theoretical Framework Relating SCS, SCF with SCP is based on 3 core constructs-(i) SCS; (ii) SCF and (iii) SCP. In this revised, in order to find out the impact of SCS and SCF on SCP exhaustive theoretical, empirical and lots of literature are reviewed. From theories and literature, following dimensions of SCS are included:

- **Innovative Strategy (INS):** Companies adopt Innovating strategies and make an effort to enter earliest or take on the fresh knowledge to achieve an advantage over the rivals.
- **Customer Oriented Strategy (COS):** Companies tries to develop trust and collaboration with customers. (Agus & Hassan, 2008).The organization with outstanding client service, sensible feature, and cutthroat price gives rise to client satisfaction.

- **Agile Supply Chain Strategy (ASCS):** Above strategy is the ability to cope with uncertainty, variation in production and product variety with the shorter product life cycle.

The triumph of an SCM depends largely on SCF, which plays a major role in the proper implementation of the supply chain. Flexibility in operation creates an opportunity for customers in unique ways. If the supply chain is eminently flexible, it would repeatedly meet up the varying requirements of clientele and will offer assistance to customers in viewing the chain favorably (Beamon, 1999). Elasticity is the competence to alter or respond with time, price tag and effort (Upton, 1994).

- **Innovative & New Product Flexibility (IF):** It is the capability to start on new and variety of product as per the need and want of customers. Due to diminishing, product lifecycle companies launch new products in the market (Arawati Agus, 2011).
- **Product Flexibility (PF):** It is the capability to customize product and service as per the need of customers (Vickery et al., 1997). Products are produced in a different color, size, and options with many distinct features.
- **Existing Product Flexibility (EPF):** Existing product flexibility related to providing customers a better product with more options in the existing product as per the need of the customer.
- **Delivery Flexibility (DF):** It is the ability to fulfill the customer requirements by reconfiguring the chain, altering the supply of product as per demand. This flexibility also involves the movement of stock between locations at a minimum distance so that faster delivery to customers can be achieved (Simona Daniela Grigore, 2007)
- **Information Flexibility (INF):** Due to the high uncertainty in the market; information system management plays a vital role, hence flexibility in information is necessary.

In addition to this, following SCP construct is operationalized namely cost performance, logistics performance, and quality performance. Companies realized the significance of monetary and non-monetary performance dealings (Fantazy *et al.*, 2009).

- **Cost Performance (CP):** Cost performance uses two proportions of economic performance; net profit and sales expansion. These two are the two most accepted performance indicator used (Fantazy *et al.*, 2009).
- **Logistic Performance (LP):** It is time period from receipt to delivery of finished goods. The lessening in lead time reduces the supply chain response time, and it straight interacts with client service (Christopher, 1992).
- **Customer Satisfaction Performance & Quality Performance (QP):** Customer satisfaction, performance & quality performance is the value for money for customers (Tracey, 1996).

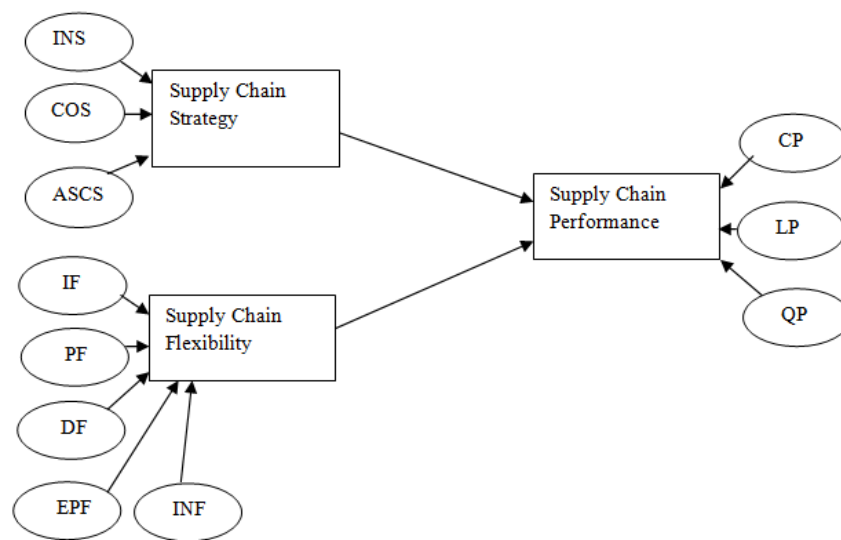


Figure 1: The Theoretical Framework Relating SCS, SCF with SCP

On the basis of the above conceptual framework, following hypothesis are developed

- **H₁:** SCS has a positive effect on SCP and business performance.
- **H₂:** SCF has a positive effect on SCP and business performance.

RESEARCH METHODOLOGY

Instruments Development

In the present study, there are two autonomous variables and a dependent variable. The autonomous variables, namely SCS and SCF and the dependent variable are SCP has been taken from preceding study and items in independent and dependent variables were adopted from the previous studies. A pre-pilot study was conducted by academicians and managers of the automobile sector to make comments on the clarity and correctness of the measures developed. After their feedback, the items were finalized. The items were measured with 5 points scale (Likert). Also, there are different methods that can be adopted for the collection of data (Saunders et al. 2007). In statistical testing, an enormous amount of structured data is required from the different respondent who fills the questionnaire¹. Hence a large number of respondents should be contacted (Cooper and Schindler 2000; Saunders et al. 2007).

Data Compilation and Examination Techniques

Data were composed of 121 managers in the automobile sector in India. For collecting the data, proper appeal correspondence was used for taking permission from the authority of the selected organizations. Total 600 questionnaires were circulated and as a final point, 121 were collected in serviceable condition. Collected information was analyzed using partial least squares (PLS) with the support of the software Smart PLS 2.0 M3.

FINDINGS

Reliability Analysis

Cronbach's alpha was conducted to evaluate the reliability of each item scale. Alpha values 0.7 and above it indicates that all the data can be well thought-out consistent (Nunally, 1978). This value is presented in Table 1. All the

construct of SCS has Cronbach's alpha more than 0.7 indicates that all items are reliable. Similarly, all construct of SCF and SCP having Cronbach's alpha more than 0.7 indicate that all items are reliable and valid for further research.

Table 1: Reliability of Each Construct

Dimensions	Cronbach's Alpha (α)	No. of Items in the Construct (Retained)
Innovative Strategy(INS)	0.767	4
Customer Oriented Strategy(COS)	0.880	5
Agile Supply Chain Strategy(ASCS)	0.831	5
Innovation & New product / Future Research Flexibility(IF)	0.889	5
Process Flexibility(PF)	0.882	7
Existing Product Flexibility(EPF)	0.850	5
Delivery Flexibility(DF)	0.882	7
Information Flexibility(INF)	0.841	5
Cost Performance(CP)	0.869	5
Logistics Performance(LP)	0.648	4
Quality Performance & Customer's Satisfaction (QP)	0.783	5

Correlation Analysis

Pearson's Correlations between SCS, SCF, and SCP is shown in Table 2 and Table 3. The correlation between independent variables (SCS and SCF) and the dependent variables (SCP) were positive. Among the SCS the innovative strategy, customer satisfaction strategy and agile supply chain strategy had a positive correlation with cost performance and quality performance, but having a weak positive correlation with logistic performance from the table of the correlation matrix of supply chain flexibility dimension with supply chain performance dimensions. It shows that, innovation & new product/future research flexibility, sourcing flexibility & process flexibility, existing product flexibility, trans-shipment and delivery flexibility and information flexibility are having a very strong positive correlation with cost performance and quality performance and logistic performance.

Table 2: Correlation Between SCS & SCP

		INS	COS	ASCS	CP	LP	QP
INS	Pearson Correlation	1					
	Sig. (2-tailed)						
COS	Pearson Correlation	.892**	1				
	Sig. (2-tailed)						
ASCS	Pearson Correlation	.778	.826*	1			
	Sig. (2-tailed)						
CP	Pearson Correlation	.474	.487	.599**	1		
	Sig. (2-tailed)						
LP	Pearson Correlation	.356	.352	.406**	.762**	1	
	Sig. (2-tailed)						
QP	Pearson Correlation Sig. (2-tailed)	.332	.367	.434**	.437*	.501**	1

*p-value <0.05, **p-value <0.01

On the other hand to find the effect of flexibility on performance; the new product flexibility is strongly correlated with cost performance, logistics performance, and quality performance. Similarly, process flexibility has a positive correlation with cost performance, logistics performance, and quality performance. Delivery flexibility had high correlations cost performance, logistics performance, and quality performance. Existing product flexibility had high correlations with cost performance, logistics performance and quality performance. Similarly, information flexibility had

high correlations cost performance, logistics performance and quality performance as shown in Table 3.

Table 3: Pearson's Correlation Between Supply Chain Flexibility & Supply Chain Performance

		IF	PF	EPF	DF	INF	CP	LP	QP
IF	Pearson Correlation	1							
	Sig. (2-tailed)								
PF	Pearson Correlation	.776** .000	1						
	Sig. (2-tailed)								
EPF	Pearson Correlation	.572** .000	.762** .000	1					
	Sig. (2-tailed)								
DF	Pearson Correlation	.715** .000	.827** .000	.773** .000	1				
	Sig. (2-tailed)								
INF	Pearson Correlation	.531** .000	.672** .000	.821** .000	.691** .000	1			
	Sig. (2-tailed)								
CP	Pearson Correlation	.652** .000	.846** .000	.814** .000	.830** .000	.786** .000	1		
	Sig. (2-tailed)								
LP	Pearson Correlation	.573** .000	.677** .000	.782** .000	.667** .000	.792** .000	.762** .000	1	
	Sig. (2-tailed)								
QP	Pearson Correlation	.457** .000	.462** .000	.426** .000	.574** .000	.377** .000	.473** .000	.501** .000	1
	Sig. (2-tailed)								

*p-value <0.05, **p-value <0.01

Hypothesis Testing Using PLS Structural Equation Modeling

An SEM model was employed to explore linkages that allow a researcher to establish the relative strength of relationships between independent (SCS, SCF) and dependent (SCP) variables. The strength of the relationship is expressed by the coefficient of determination (R^2). In the present study, the value of the coefficient of determination for cost performance is 0.88, for logistic performance 0.67 and for quality performance it is 0.41.

To find the impact of supply chain strategy on supply chain performance parameters such as cost performance, logistic performance and quality performance the results are shown in Table 4. The current research shows that innovative strategies have a negative impact on cost performance, weak positive impact on logistic performance and negative impact on quality performance. While customer-oriented strategies have a positive impact on cost performance and negative impact on logistic and quality performance. Finally, agile supply chain strategies have a weak positive impact on cost performance, weak negative impact on logistic performance and positive impact on quality performance.

Table 4: Total Effect of SCS on SCP

	INS	COS	ASCS
	<i>Path Coefficient</i>		
CP	-0.199*	0.151*	0.211
LP	0.022*	-0.081*	-0.017
QP	-0.172*	-0.013*	0.301*

Path significance: * p < 0.05

(t-value > 1.96 (for 2-tailed) which is equivalent to p < 0.05).

On a similar basis, to find the impact of SCF on SCP, the results of current research shows in Table 5. Results show that new product flexibility has a negative impact on cost performance while it has a positive impact on logistics performance and a weak positive impact on quality performance. In a similar fashion, process flexibility has a moderately positive impact on cost performance while it has a negative impact on logistics and quality performance. Delivery flexibility and existing product flexibilities have positive impact on cost, logistic and quality performance and finally, information flexibilities have a positive impact on cost and logistics performance while it has a negative impact on quality performance

Table 5: Total Effect of SCF on SCP

	NPF	PF	DF	EPF	INF
	<i>Path Coefficient</i>				
CP	-0.226	0.417	0.145*	0.283	0.248
LP	0.245*	-0.162*	0.225*	0.269*	0.376
QP	0.083*	-0.291*	0.694	0.189*	-0.193*

Path significance: * $p < 0.05$

(**t-value** > 1.96 (for 2-tailed) which is equivalent to $p < 0.05$).

DISCUSSIONS

The present examination explored the roles played by strategy and flexibility to enhance the SCP, in order to remain quick to respond against the customer demand, the supply chain managers must think about the innovative strategies and more flexibility alongside other practices in SCM. The present investigation has appeared important discoveries with respect to the supply chain performance. In this way, the present examination investigated 3 SCS as the predictors of supply chain performance. Out of these 3 strategies, the innovative strategy is a very weak effect on performance; similarly, customer-oriented strategies have a negative impact on performance while agile supply chain strategies have a positive impact on cost and quality performance, but a negative impact on logistic performance. In the present study, explored five supply chain flexibility construct, innovative and new product flexibility has a negative impact on cost performance and positive impact on logistic and quality performance. Product flexibility has a positive impact on cost performance while having a negative impact on logistic and quality performance. Delivery and existing product flexibility has a positive impact on all constructs of performance. Finally, information flexibility has a positive impact on cost and logistic performance and has a negative impact on quality performance.

CONCLUSIONS AND IMPLICATIONS

Due to the growing demand for high quality and technological innovative product; manufacturing companies must constantly focus on improving their efforts in efficient and effective implementation and quality operations of SCM. Supply chain management gives a vision by which, the organization focuses on a quality product, production and constant improvements in product quality. The results of the study assist in the understandings of how SCS determinants influence supply chain performance and business performance. Due to the technological revolution, rapid innovation and lean production aspects; SCM processes have a greater degree of flexibility to bolster SCM implementations. On the finishing note from the study, it is concluded that implementation of efficient and effective SCM practices would eventually result in constructive gains in the performance of any firm.

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